

Sub
P1
concl'd

$10 \leq T2 \leq 50 \mu\text{m}$

$0.2 \leq T1/T2 \leq 5.$

2. (Amended) A method for producing a plasma display, comprising the steps of coating a substrate with a plurality of barrier ribs, with three phosphor pastes respectively containing a phosphor powder emitting light of red, green or blue, as stripes in the spaces between the respectively adjacent barrier ribs, from a paste applicator with outlet holes, and heating to form a phosphor layer, wherein the lateral side wall thickness (T1) of the phosphor layer at the position corresponding to a half of the height of each barrier rib and the bottom wall thickness (T2) of the phosphor layer satisfy the following relation:

$10 \leq T1 \leq 50 \mu\text{m}$

$10 \leq T2 \leq 50 \mu\text{m}$

$0.2 \leq T1/T2 \leq 5.$

In Claim 8, line 2, please delete "used".

In Claim 9, line 2, please delete "used".

In Claim 10, line 2, please delete "used".

Sub
P1
concl'd

11. (Amended) A method for producing a plasma display, according to Claim 1 or 2, wherein [the paste applicator used for coating is 60 to 400 μm in] the average diameter (D) of outlet holes is 60 to 400 μm .

In Claim 13, line 4, please delete "from it".

In Claim 16, line 2, please delete "one", both occurrences.

In Claim 17, line 3, please change "relatively" to --relative to--.

Sub
P1
concl'd

19. (Amended) A method for producing a plasma display, according to Claim 1 or 2, wherein after the paste applicator and the substrate have begun movement relative to [been started to be moved relatively] each other in parallel to the barrier ribs on the

Sub
B3
concl
Sub
20/ substrate, the application of phosphor pastes is started, and before the relative movement is stopped, the application is stopped.

20/ (Amended) A method for producing a plasma display, according to Claim 1 or 2, wherein each of the phosphor powders [used is] has a 50 wt% grain size of 0.5 to 10 μ m [in the grain size of 50 wt% of the powder] and 0.1 to 2 m²/g in specific surface area.

In Claim 21, line 2, please change "powders" to --pastes--.

In Claim 25, line 2, please delete "the", second occurrence.

In Claim 29, line 3, please change "used has" to --have--.

In Claim 31, line 2, please change "the top" to --their top--.

Sub
C7
BA 33. (Twice Amended) An apparatus for producing a plasma display, comprising a table for fixing a substrate with a plurality of barrier ribs formed on the surface, a paste applicator with a plurality of outlet holes to face the barrier ribs of the substrate wherein the average diameter (D) of the outlet holes of the paste applicator and the length (L) of each of the outlet holes satisfy the following relation:

$$L/D = 0.1 \sim 600; \text{ [and]}$$

[a supply means for supplying] a phosphor paste supply operatively connected to the paste applicator, and a moving [means] actuator for three-dimensionally moving the table and the paste applicator [relatively] relative to each other; and

a positioning controller operative and effective to adjust the angle of inclination of the paste applicator to top ends of the barrier ribs of the substrate, while keeping tips of the outlet holes of the paste applicator at a predetermined distance from the barrier ribs of the substrate.

ne In Claim 35, line 4, please change "the" to --a--.

In Claim 39, line 3, please change "20 to 2000" to --150 to 2000--.

In Claim 45, line 2, please delete "the", first occurrence.

In Claim 46, line 2, please delete "the", first occurrence.

In Claim 49, line 6, please delete "the", first occurrence.

In Claim 51, line 6, please delete "the", second occurrence; and
line 8, please delete "the", second occurrence.

In Claim 54, line 4, please delete "the", second occurrence; and
line 6, please delete "the", second occurrence.

In Claim 55, line 6, please delete "the", second occurrence.

In Claim 58, line 9, please change "relatively" to --relative to--.

Kindly cancel Claims 32, 34, 36, 47 and 52 without prejudice and without
disclaimer of the subject matter thereof.

REMARKS

We have amended a number of the claims in accordance with the Examiner's helpful suggestions with respect to overcoming the 35 U.S.C. §112 rejections. Also, a number of the claims have been revised to place them into proper idiomatic English form. We accordingly respectfully request withdrawal of the 35 U.S.C. §112 rejection. To the extent that further amendments to any of the claims would be helpful in clarifying the subject matter therein, we would be happy to discuss the matter directly with the Examiner to facilitate allowance.

Claims 1 and 2 have been amended to add the subject matter of Claim 32 therein. Accordingly, Claim 32 has been canceled. We have also added the subject matter of Claim 52 into Claim 33 and amended Claim 39 to change the lower range limit from "20" to --150--. Finally, we have canceled Claims 34, 36, 47 and 52.

Turning now to the merits of the invention, there are three fundamental types of methods for forming phosphor layers, namely screen printing, photo paste and direct printing. These methods are described in the unexecuted Declaration of Mr. Yuichiro

Iguchi, a co-inventor herein, that is enclosed herewith. We will submit the executed Declaration upon receipt. Mr. Iguchi's Declaration makes it clear that there are significant disadvantages in the screen printing and photo paste methods of the prior art and, similarly, shows the highly advantageous aspects of direct printing in accordance with the invention. With that background in mind, we turn to the prior art and the individual rejections.

We note with appreciation the Examiner's confirmation that EP 0 806 786 A1 and US 5,921,836 are not prior art against Claims 1 - 3, 5, 6, 11, 16, 20, 22 and 27 - 29. Thus, we acknowledge that US '836 is hypothetically applicable to Claims 4, 7, 9, 12, 17 and 31. However, those claims depend from Claims 1 and 2, which specifically state that, among other things, the lateral side wall thickness (T1) of the phosphor layer at the position corresponding to a half of the height of each barrier rib and the bottom wall thickness (T2) of the phosphor layer satisfy the following relation:

$$10 \leq T1 \leq 50 \mu\text{m}$$

$$10 \leq T2 \leq 50 \mu\text{m}$$

$$0.2 \leq T1/T2 \leq 5.$$

US '836 simply lacks teachings or suggestions that would lead one of ordinary skill in the art to have any appreciation for these specifically claimed parameters. In fact, US '836 makes no mention of numerical coating thicknesses at all. We accordingly respectfully submit that US '836 is inapplicable to Claims 4, 7, 9, 12, 17 and 31 inasmuch as there is no motivation for changes to be made based on the teachings and disclosure of US '836.

With respect to Shinoda et al., we fully appreciate that they disclose a full color, three-electrode surface discharge-type plasma display device having some similarities to the plasma displays of the invention. However, there are important differences between the Shinoda et al. disclosure and the subject matter recited in Claims 1, 2, 4, 9, 16, 22,

31 and 32. Unfortunately, Shinoda et al. falls into the category of the so-called “screen printing method” which is well known in the art as acknowledged and described in detail by the Applicants in their specification beginning on page 2 at line 12 and extending through page 3 at line 8. In fact, Shinoda et al. specifically acknowledge this characterization as demonstrated at the top of Column 19, wherein they state that phosphor layers are typically coated on a substrate by a “screen printing method.” Such screen printing methods have the serious disadvantage that three screens are needed (one each for red, green and blue) and the screens rapidly deform over the course of repeated printing, thereby lowering accuracy and making it difficult to form a fluorescent material layer capable of providing a highly precise plasma display. There is also the serious disadvantage that the cost of utilizing such screen printing methods is high, since the screens must be frequently replaced. For example, oftentimes a mere 200 plates are produced before the screens need to be replaced.

In any event, the screen printing method of Shinoda et al. is sharply different from the subject matter recited herein. Specifically, Shinoda et al. fails to disclose a paste applicator with a plurality of outlet holes. In sharp contrast, what Shinoda et al. discloses is a screen having a series of openings and a squeezer 82 mounted on a holder 83. Such a disclosure is clearly not a paste applicator having a plurality of outlet holes.

In the invention, the paste applicator is a structure which can contain paste and has a plurality of outlet holes. In Shinoda et al. there is simply a screen having openings, but not outlet holes, upon which paste is applied. Then, an applicator, in the form of what is essentially a squeegee, applies force to the paste, thereby squeezing it through the openings. However, the applicator itself does not have outlet holes.

In other words, if one of ordinary skill in the art considers the holder 83 and squeezer 82 to be the paste applicator, it does not have holes. On the other hand, if the

screen 80 is considered to be the paste applicator, then it has openings, but not outlet holes, since the screen 80 is not capable of containing the paste and, all by itself, is not capable of applying the paste between the barrier ribs. Thus, it is clear to those of ordinary skill in the art that Shinoda et al. is representative of the known prior art that is completely different from a paste applicator with a plurality of outlet holes as recited herein. Withdrawal of the 35 U.S.C. §102 rejection of Claims 1 - 2, 4, 9, 16, 22 and 31 - 32 over Shinoda et al. is accordingly respectfully requested.

We respectfully submit that Shinoda et al. is also inapplicable to Claims 3, 5 - 7, 11, 21, 26 and 30 for the same reasons as set forth above with respect to the 35 U.S.C. §102 rejection and, further, that there are no teachings or suggestions to those of ordinary skill in the art to utilize a paste applicator with a plurality of outlet holes. In fact, we respectfully submit that there is nothing in Shinoda et al. that would lead one of ordinary skill in the art to make modifications to the screen printing method that they utilize, which does not utilize the paste applicator with a plurality of outlet holes as recited in the claims. In fact, we respectfully submit that Shinoda et al. is so completely devoid of teachings or suggestions with respect to modifications away from the screen printing method using a combination of a screen 80 and a squeezer 82, that their disclosure would be non-enabling with respect to the hypothetical use of a paste applicator with a plurality of outlet holes.

Shinoda et al. is still further inapplicable to Claims 3, 5 - 7, 11, 21, 26 and 30 inasmuch as an obviousness rejection requires not only teachings and/or suggestions to make a modification, but that there be a reasonable expectation of success if such modifications were to be made. In the case of Shinoda et al., there are not only no teachings or suggestions to make a modification, but one of ordinary skill in the art would have no reasonable expectation of success if such hypothetical modifications were to be made. We accordingly respectfully request withdrawal of the 35 U.S.C. §103 rejection

based on Shinoda et al.

With respect to the further hypothetical application of Osaka et al. with Shinoda et al. as applied to Claims 20 and 27, we respectfully submit that Osaka et al. does not provide any teachings or suggestions to those of ordinary skill in the art that would cure the fundamental deficiencies of Shinoda et al. Thus, even if one of ordinary skill in the art were to make the hypothetical combination, the resulting structure would still fail to teach or suggest the claimed paste applicator with outlet holes as recited in the claims. The fact that Osaka et al. teaches a variety of phosphor paste compositions having specific particle sizes and viscosities is incapable of filling the gap of Shinoda et al. Withdrawal of the 35 U.S.C. §103 rejection of Claims 20 and 27 over the hypothetical combination of Osaka et al. with Shinoda et al. is accordingly respectfully requested.

Similarly, we respectfully submit that the hypothetical combination of Yamaura et al. with Shinoda et al. fails to teach or suggest the subject matter recited in Claims 28 and 29. The fact that Yamaura et al. discloses a phosphor composition that may include photosensitive components does not fill the gap in Shinoda et al. with respect to a paste applicator with a plurality of outlet holes. Accordingly, we respectfully request withdrawal of the 35 U.S.C. §103 rejection of Claims 28 and 29.

With respect to the 35 U.S.C. §103 rejection of Claims 8, 13 - 15, 19, 21, 26 and 31 over US '836, we respectfully submit that, in view of the amendments to Claims 1 and 2 which recite that the lateral side wall thickness (T1) of the phosphor layer at the position corresponding to a half of the height of each barrier rib and the bottom wall thickness (T2) of the phosphor layer satisfy the following relation:

$$10 \leq T1 \leq 50 \mu m$$

$$10 \leq T2 \leq 50 \mu m$$

$$0.2 \leq T1/T2 \leq 5,$$

which is clearly not taught by US '836, this renders those solicited claims clearly patentable under §103 since those claims depend either directly or indirectly from Claims 1 and 2.

We acknowledge the hypothetical application of US '574 to Claims 10, 33 - 41, 43 - 44, 47 - 49, 51 - 56 and 58 in combination with US '836. However, '574 has nothing to do with plasma displays and is limited to disclosure of methods for fabricating superconducting wires and rods, which, as noted above, have no relationship with respect to plasma displays or a paste applicator for a fluorescent paste. Thus, one of ordinary skill in the art would have no incentive to look to '574 as a possible hypothetical combination with US '836.

Moreover, there is nothing in '574 or US '836 that teaches or suggests the lateral side wall thickness (T1) of the phosphor layer at the position corresponding to a half of the height of each barrier rib and the bottom wall thickness (T2) of the phosphor layer satisfy the following relation:

$$10 \leq T1 \leq 50 \mu\text{m}$$

$$10 \leq T2 \leq 50 \mu\text{m}$$

$$0.2 \leq T1/T2 \leq 5,$$

which is included in Claim 10, which depends from Claims 1 and 2. Also, there is nothing in either '574 or US '836 that teaches those of ordinary skill in the art to utilize a paste applicator having a position controller operative and effective to adjust the angle of inclination of the paste applicator to top ends of the barrier ribs of the substrate, while keeping tips of the outlet holes of the paste applicator at a predetermined distance from the barrier ribs of the substrate as recited in those claims. As described in Mr. Iguchi's Declaration, such a controller is necessary to produce plasma display panels having coating layers of the type that are efficient and highly uniform. When the paste applicator has a

multiplicity of outlet holes to improve the productivity of plasma display panels, the absence of such a controller causes very poor results. Thus, one of ordinary skill in the art would have no incentive to make a change from a multi-nozzle structure having 5 to 30 nozzles as suggested in US '836. The claimed paste applicator can have many, many holes, such as 640 holes as described at page 71, line 10 (Example 4) of the Applicants' Specification, and can produce plasma display panels having coating layers of the type that are efficient and highly uniform. That number of holes is more than 20 times greater than in US '836. Plus, the paste applicator of the invention has surprising advantage in productivity and quality of the resulting plasma display panel. We accordingly respectfully request withdrawal of the rejection of Claims 10, 33 - 41, 43 - 44, 47 - 49, 51 - 56 and 58 based on the hypothetical combination of US '574 with US '836.

With respect to the rejection of Claims 18 and 50 in view of the hypothetical combination of Mettenbrink with US '836, we respectfully submit that Mettenbrink does not fill the gap created by US '836 with respect to a paste applicator having the above-described controller. Withdrawal of the rejection of Claims 18 and 50 is respectfully requested.

The same principles apply to the hypothetical combination of Igarashi et al. with US '836. There is simply nothing in either Igarashi et al. or US '836 that would lead one of ordinary skill in the art toward the invention as recited in Claim 23 with respect to the lateral side wall thickness (T1) of the phosphor layer at the position corresponding to a half of the height of each barrier rib and the bottom wall thickness (T2) of the phosphor layer satisfy the following relation:

$$10 \leq T1 \leq 50 \mu m$$


$$10 \leq T2 \leq 50 \mu m$$

$$0.2 \leq T1/T2 \leq 5.$$

Finally, with respect to the rejections based on the hypothetical combination of Mizuno et al. and Silverbrook in combination with US '836 and/or Shinoda et al., we respectfully submit that there is, once again, nothing in the secondary references that cures the omissions of the primary reference (US '836) for the reasons set forth above.

In light of the foregoing, we respectfully submit that the entire application is now in condition for allowance, which is respectfully requested.

Respectfully submitted,


Austin R. Miller
Reg. No. 16,602
Attorney for Applicants

ARM:lh
(215) 563-1810

